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ABSTRACT

Thirty-eight teachers and 96 low achieving students from 10 elementary schools were involved in a study designed to evaluate the effects of an inservice training course, "Tutoring in Mathematics", on teachers in mainstreaming settings. Course effects were defined in terms of specific tutoring skills and teacher attitudes about working with mainstreamed students. Changes in student math achievement and attitudes toward math were also examined. Experimental teachers took the 6-week course while control teachers received no training. A videotape of a tutoring session was taken before and after training. Three of the nine tutoring skills (specific verbal praise, negative comments, and teacher declarations) reached statistical significance at posttest for the experimental teachers; control teachers did not exhibit significant gains in tutoring skills. Significant gains were also achieved on the total attitude scale and two attitude subscales for experimental teachers only. Pre-post math attitude and math achievement scores were collected for the students. Students of experimental teachers showed significant gains in total math achievement particularly in addition, subtraction, and multiplication subscales, whereas students of control teachers did not exhibit similar gains. Data on student attitude toward math indicated no significant increase or decrease for both student samples. (Author/SB)

EFFECTS OF A MEDIATED TRAINING COURSE ON TEACHERS AND STUDENTS IN MAINSTREAMING PROGRAMS

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TABLE OF CONTENTS

ABSTRACT

This study evaluated the effects of an in-service training course, Tutoring in Mathematics, on teachers in mainstreaming settings. Course effects were defined in terms of specific tutoring skills and teacher attitudes about working with mainstreamed students. Changes in student math achievement and attitudes toward math were also examined. Thirty-eight teachers from 10 elementary schools in the San Francisco Bay Area were assigned to either an experimental or control group. Experimental teachers took the six-week course while Control teachers received no training. A videotape of a tutoring session was taken before and after training. Three of the nine tutoring skills reached statistical significance at posttest for the experimental teachers; control teachers did not exhibit significant gains on tutoring skills. Significant gains were also achieved on the total attitude scale and two attitude subscales for experimental teachers only. Pre-post math attitude and math achievement scores were collected for a total of 96 mainstreamed and low achieving students. Students of experimental teachers showed significant gains in total math achievement particularly in addition, subtraction and multiplication subscales, whereas students of control teachers did not exhibit similar gains. Data on student attitude toward math indicated no significant increase or decrease for both student samples.

I. NATURE AND BACKGROUND OF THE STUDY

Educational programming for the EMR student is currently undergoing an identity crisis. In the past, the self-contained special class represented for all intents and purposes, the only kind of special educational service available for EMR students. Within the last decade, the concept of mainstreaming has gathered substantial momentum in the field. Mainstreaming, in effect, represents the reverse of the special class advocacy; it maintains that some or most of the EMR students are better served, not in the special class, but in the mainstream of the regular class. Several reasons for the mainstreaming impetus have been cited in the literature (Meyen, Vergason, and Whelan, 1975; Kaufman et. al., 1975; Cohen and DeYoung, 1973). They include: court decisions, state and local policy changes, and educators' influence. Cases filed before state and federal courts have focused on the right of handicapped students to public education and the right to an appropriate placement in the least restrictive environment. Most noted of these court cases are PARC vs Commonwealth of Pennsylvania; Diane vs Board of Education; and Larry P. vs Riles. Local and state educational policies have become more flexible in regard to pupuil accounting procedures, thereby encouraging experimentation with mainstreaming programs (e.g. Texas, California, Georgia). Special educators also have asserted their influence through public statements expressing disenchantment with the efficacy of the self-contained class (Dunn, 1968; Lilly, 1971).

A number of points are worth noting regarding the current conception and status of mainstreaming. First of all, literature on the efficacy of the

self-contained class has often been cited to support the mainstreaming movement. Two general conclusions have been drawn from that literature: first, the self-contained special class has failed to demonstrate efficacy in terms of academic achievement as well as social adjustment of the EMR student; secondly, labeling students as EMR has long and lasting stigmatizing effects. However, reviewers of efficacy studies have all pointed out certain methodological problems inherent in these studies (Johnson, 1962; Kirk, 1964; Cain, 1963; Blackman and Hein, 1966; Guskin and Spicker, 1968; Gardner, 1966; Lawrence and Winschel, 1973; MacMillan, 1971). The most serious problem lies in the lack of equivalence between groups of EMR students on whom comparative studies were done. Thus, while efficacy studies may have failed to demonstrate effectiveness of the self-contained class, they have also failed to demonstrate that these classes are ineffective. In short, the research basis for determining the efficacy of the self-contained class is too tenuous to support any definitive conclusions.

As far as the issue of labeling effects is concerned, careful analysis of the literature (MacMillan, Jones and Aloia, 1974) shows that studies on labeling have included numerous confounding variables (curriculum, segregation, teacher/pupil ratio) which make it impossible to isolate the effects of labels per se. Again, there is no conclusive empirical evidence indicating that labels have devastating and lasting effects. Despite the lack of empirical base either to support or to indict the self-contained special class, mainstreaming, as an alternative service model to the self-contained class, began to accelerate in the last decade. Thus the ground-swell of the mainstreaming movement appears to be more attributable to legal, social, and political pressure than to data that may attest to the educational soundness of the practice.

The second point worth noting is that mainstreaming is a broad umbrella concept covering a range of program options and specifications. According to one definition of the construct (Kaufman et al, 1975), mainstreaming programs are likely to differ substantially on 1) the manner, degree, and context in which EMR students are integrated, 2) the extent of individualized planning and programming for mainstreamed EMR students, and 3) the clarity with which roles and responsibilities are defined among the administrative, instructional, and support personnel. Examination of case descriptions of mainstreaming programs (Chaffin, 1975; Birch, 1973; Kreinberg and Chow, 1973; Beery, 1972; Deno, 1973) certainly attests to the heterogeneity of programs as they are implemented in the nation's schools. In studying mainstreaming, researchers must recognize the heterogeneous and multi-faceted nature of mainstreaming and begin to identify and extricate within-treatment variations that contribute to the accomplishment of mainstreaming goals (Kaufman, et al, 1975).

Finally, mainstreaming should not be viewed as a program option to replace the self-contained class. The self-contained class is probably the best program placement for some EMR students. Research on aptitude-treatment interaction (ATI) suggests the use of differential programming to accomodate individual difference in students (Berliner and Cahen, 1973; Reynolds and Barlow, 1972). Instead of devoting attention only to the consideration of integration vs segregation, or special vs regular placement, which Valletutti (1969) characterized rather aptly as a "useless dialectic, it is more appropriate to explore and experiment with programming options in addition to, not in lieu of, existing practices. For the mainstreaming

option, it should be determined "to what extent, and under what conditions, can a wide range of individual differences be accomodated in the regular class" (MacMillan, 1971).

In order to accomodate wider individual needs in the regular classroom and to implement a mainstreaming program successfully, one of the prima facie needs is staff development for the regular classroom teacher (Deno, 1973; Martin, 1974). Presently there are indications suggesting that teachers and principals are not ready to include the handicapped in their classes because they have little or no academic or practicum experience in the area of Special Education (Melcher, 1972; Shotel, Iano and McGettigan, 1972). The emergence of collective bargaining for teachers provides even stronger indication of this phenomenum in that existing contracts provide for the elimination of handicapped students, particularly disruptive students, rather than the amelioration of the problem in the regular classroom (Sosnowsky and Coleman, 1971).

While it is recognized that staff development can be the vehicle to overcome resistence on the part of regular educators, and while schools and teacher training institutions are beginning to engage in some form of in-service training for the regular classroom teacher, little is known about the effects of these training efforts. A few studies have examined the effects of in-service training on attitudes of regular classroom teachers towards mainstreaming (Glass and Meckler, 1972; Klinger, 1972; Yates, 1973; Shotel, et al, 1972). These studies generally showed improved teacher attitudes

towards mainstreaming after training, although in one study, attitudes of regular classroom teachers towards mainstreamed EMR students deteriorated after one year of working with these students (Shotel, et al., 1972). In a recent study (Safer and Agard, 1975), the authors found that in-service training appears to have significant effects only on teacher knowledge of appropriate placement of handicapped students. The authors concluded that global indicators of in-service training, i.e., hours, content, teacher assessment of effectiveness of training, failed to predict changes in teacher attitudes or changes in curriculum and mangement techniques. They recommended that "future research should examine more closely very specific types of in-service training dimensions such as format, special content and practicum experience."

The current study is designed to assess the effectiveness of a teacher in-service training course, Tutoring In Mathematics, for teachers in mainstreaming settings. The course uses a specific training format, i.e., teacher self-study and self-assessment using videotape and playback; it concentrates on specific teacher skills, i.e., asking diagnostic questions in the context of tutoring handicapped students in math; it provides ongoing practicum experience, i.e., training is done on the natural context of the classroom, and teachers work with students who have been placed in their classrooms for all or a major part of the school day.

The structured tutoring strategy used in Tutoring in Mathematics has been shown to be a powerful means of improving student achievement in regular classroom contexts (Bernstein, 1959). Studies using tutoring as a teaching

strategy with handicapped students also showed that it produced significant gains in student achievement (Zedler, 1968; Newborg, 1971; Stowitschek and Hofmeister, 1974; Jenkins, et al, 1974).

II. COURSE DESCRIPTION

Tutoring In Mathematics is an in-service, self-study course for teachers at the elementary level. Materials include a handbook and three instructional films. The course takes about four hours of teacher-time per week for six weeks. The instructional sequence includes four steps: 1) teachers read brief description of tutoring skills in the handbook; 2) they review a short film in which these skills are demonstrated, 3) they practice the skills with one or two of their own students and videotape the practice session; and 4) they play back the videotape and evaluate their performance of specific tutoring skills according to guidelines contained in the handbook. The course focuses on helping teachers acquire skills to provide appropriate verbal praise, to ask diagnostic questions, to use demonstration techniques, and to minimize the use of negative comments and teacher declarations. In addition, the course provides built-in opportunities for teachers to have some short (10-15 minutes) but concentrated amounts of time to work individually with mainstreamed students and other students who are experiencing difficulties in math.

III. OBJECTIVES OF THE STUDY

The study is designed to assess the effectiveness of the math tutoring course. Its objective are two-fold:

1. To evaluate the immediate and long-term effects of the teacher training course on teachers and aides in terms of their a) tutoring skills, b) attitudes about working with mainstreamed students, and c) amount of tutoring time spent with these students.
2. To explore the relationship of changes in student math achievement and attitudes toward math to tutor (teacher and aide) performance.

This paper will provide some preliminary findings related to these objectives. Since additional data collection and analysis activities have not been completed, the current paper will not be able to address these issues in full. However, some preliminary conclusions will be drawn.

IV METHOD

Description of Sample

Teacher Sample

A total of 38 volunteer teachers from 10 elementary schools in the San Francisco Bay Area participated in the study. They were assigned randomly by school to the experimental or control groups. Demographic information on experimental and control teachers appears below.

Table 1

Demographic Data on
Experimental and Control Teachers

Demographic Variable		Experimental (N=24)	Control (N=14)
No. of years of teaching experience	1-2 yrs.	3	1
	3-6 yrs.	2	4
	7 or more	19	9
No. of years with mainstreaming program	1 year or less	6	4
	2-3 yrs.	4	5
	4 or more yrs.	9	5
	NR	5	0
Taken courses in Special Education:	yes	12	8
	no	12	6
If yes, how many courses:	1-2	3	1
	3-4	2	5
	5 or more	7	1
	NR	0	1
Year last Special Education course was taken:	1950 or earlier	1	0
	1961-1965	0	0
	1966-1970	2	4
	1971-1973	4	4
	1974-1975	5	0

Both experimental and control teachers are highly experienced teachers with several years of teaching experience with mainstreaming programs. About 50% of the experimental and control teachers have taken courses in Special Education. Of those who have taken courses in Special Education, the experimental teachers appear to have taken slightly more courses and at a later date (1974-1975) than the control teachers.

Student Sample

Students in each of the 38 classes (grades 4-6) constituted the larger student sample. Within this large sample, subsamples of mainstreamed and low achieving students were identified as follows: first, each teacher was asked to nominate 10 students from his/her classroom who were low achievers in math. To cross-validate the teacher nominations, a Content-Referenced Math Test developed by the project staff was then administered to all students, and a list of students who scored lowest on the test was prepared. Six of the low achieving students who appeared on both the teacher nomination list and the math test list constituted a subsample of low achieving students for each of the 38 classes.

Teachers were then asked to select and work with three of the six identified students during the six-week training period, leaving three students in each class who were not tutored while the teachers were being trained. These remaining students are designated as the target students; they include 72 students for the experimental teachers and 58 students for the control teachers. The students teachers selected to work with during training had slightly higher math achievement scores than target students on the pre-test, although both groups were substantially lower in math achievement than the regular students. Therefore, the group of target students mentioned in this

report actually had the lowest math achievement scores in the class. The breakdown of student samples is presented in Table 2.

Table 2

Sample Size of Experimental and Control Students by Grade and by Status

	Experimental (N=474)		Control (N=314)	
	Regular	Target	Regular	Target
4th Grade	151	27	102	29
5th Grade	141	20	80	10
6th Grade	110	15	74	19
Total	402	72	256	58

Study Design

The study employs a two-group pre-posttest design with repeated measures. A pretest (O_1), a posttest (O_2) and two delayed posttests (O_3 and O_4) are given for both experimental and control teachers. Graphically, the design is as follows:

Experimental: O_1 . X O_2 O_3 O_4

Control: O_1 O_2 O_3 O_4

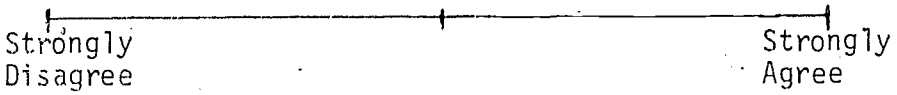
The experimental teachers were given the six week training course (X) while the control teachers were not. Time intervals between occasions were nine weeks apart except between O_1 and O_2, which were six weeks apart.

Instrumentation

At each occasion (O_1 through O_4) the following teacher measures were taken: the Teacher Opinion Questionnaire and videotape of tutoring session.

The Teacher Opinion Questionnaire was developed to measure teacher attitudes about working with mainstreaming students. The instrument consists of 12 items in a modified Likert format. The following item is illustrative.

I feel unprepared to work with students with learning difficulties.



Teachers were asked to place an "X" along the continuum to indicate the strength of their agreement or disagreement with the statement. The instrument consists of four sub-scales; each subscale contains four items. The subscales are: attitude about own confidence to work with handicapped students, attitude about handicapped students' ability to learn, and attitude about mainstreaming as an efficacious arrangement for handicapped students (primarily EMR).

A fifteen minute videotape of a tutoring session was also taken of each teacher at each occasion. Trained raters then observed each videotape for the presence/frequency of eight tutoring skill variables. The following table represents interrater reliability coefficients for each of the skill variables.

Table 3

Interrater Reliability Coefficients
for Videotaped Teacher Tutoring Skills

Teacher Variable	r
Verbal Praise	0.91
Specific Verbal Praise	0.84
Negative Comments	0.96
Teacher Declarations	0.97
General Diagnostic Questions	0.90
Specific Diagnostic Questions	0.92
Multiple Questions	0.62
Demonstration Techniques	0.93

Students were administered a Math Content-Referenced Test and a math attitude scale, How I Feel About Math. These instruments were administered at the same time intervals as the teacher measures, except that one of the occasions (O_2) was omitted for students since the time lapse between O_1 and O_2 was too short (6 weeks) to expect much student growth.

The Math Content-Referenced Test consists of 32 math problems with six subscales: place value, addition, subtraction, multiplication, division, and fraction. These math operations were chosen because they represented the types of math instruction that occurred during the schoolyear. The test was tried with a different sample of 4th through 6th grades (N=79) and items were revised as a result of the pilot test.[1]

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1 Results of pilot test:

4th grade :	X=12.59	S.D.=4.96	alpha =.86
5th grade :	X=18.96	S.D.=4.90	alpha =.84
6th grade :	X=22.42	S.D.=7.80	alpha =.92

The How I Feel About Math[2] scale was designed to elicit student attitudes about math. The test was originally developed by Mastanuno (1970) and it consists of 28 true-false items, yielding a single measure of math attitude. To avoid having reading ability as a possible contaminant of math attitude, a test administrator read the items to entire classes of students.

In addition to these measures, teachers were asked to provide estimates of time spent tutoring individual students on the basis of one random day a week over a nine week period. A tutoring time log with nine data points was prepared for each experimental and control teacher. The tutoring log provides a source of data from which aggregates of total tutoring time by teacher and by individual student can be obtained.

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2 Test-retest reliability coefficient was 0.77.

V. RESULTS

The objectives of the study are:

1. To evaluate the immediate and long-term effects of the teacher training course on teachers and aides in terms of their a) tutoring skills, b) attitudes about working with mainstreamed students, and c) amount of tutoring time spent on these students.
2. To explore the relationship of changes in student math achievement and attitudes towards math to teacher performance.

This section will only provide some partial answers to these questions. Questions related to long-term effects of training, training effects on teaching aides, and much of the correlates of changes in student performance are not addressed in this report of preliminary findings. However, findings on immediate impact of the course on teachers and the subsequent changes in student performance are available, and they are presented in this section.

Teacher Outcomes

Descriptive statistics and t-tests were generated for pre- and post-test teacher measures for both experimental and control group teachers. Teacher outcomes include tutoring skills, attitudes about working with handicapped students, and tutoring time. Data for Teacher Tutoring Skills are summarized in Table 4.

Table 4

Teacher Tutoring Skills, Pre- and Post-Training
for Experimental and Control Subjects

	Experimental (N=24)					CONTROL (N=13)				
	PRE		POST		t	PRE		POST		t
Teacher Skills	X	S.D.	X	S.D.		X	S.D.	X	S.D.	
Verbal Praise	14.75	8.97	16.66	7.66	1.27	15.13	9.99	11.82	6.71	1.30
Sp. Verbal Praise	0.57	0.83	1.09	1.09	2.10*	0.48	0.81	0.82	0.98	1.10
Negative Comments	4.18	3.67	2.34	1.82	2.68**	3.47	3.25	2.90	2.22	0.76
Teacher Declara.	7.55	4.74	5.29	4.21	2.18*	7.43	4.66	6.15	3.25	1.11
Gen. Diag. Ques.	3.10	2.07	3.51	2.94	0.57	2.23	1.61	0.93	1.02	2.32*
Spec. Diag. Ques.	18.63	8.83	17.99	9.37	0.38	14.82	6.58	16.42	6.39	0.69
Multiple Ques.	1.55	1.51	1.25	1.29	0.71	.86	1.15	0.76	0.98	0.22
Demonstra. Types	1.21	0.82	1.13	0.80	0.50	1.00	0.54	1.23	0.60	1.90
Demonstra. Time	4.67	4.88	5.76	5.04	1.44	4.21	4.28	5.03	4.17	0.48

* $P < .05$
** $P < .01$

For the experimental teachers, three of the nine teachers skills reached statistical significance: specific verbal praise, negative comments, and teacher declarations. The control teachers did not exhibit similar significant changes on these skills. However, the control teachers did show a significant deterioration of the general diagnostic question skill.

Teacher attitudes from pre- to post-training are displayed in Table 5.

Table 5

Teacher Attitudes, Pre- and Post-Training
for Experimental and Control Subjects

	Experimental (N=24)					Control (N=13)				
	PRE		POST		t	PRE		POST		t
Teacher Attitudes	$\bar{X}$	S.D.	$\bar{X}$	S.D.		$\bar{X}$	S.D.	$\bar{X}$	S.D.	
Total Attitude	89.72	14.17	100.82	13.10	4.15**	79.60	9.45	81.21	12.59	0.55
Att./Confidence	31.10	6.19	34.48	4.21	3.73**	29.75	6.06	29.29	7.11	0.38
Att./Handicapped	28.55	7.06	33.83	6.21	4.45**	25.44	5.16	26.60	4.85	1.01
Att./Mainstreaming	30.48	8.12	32.52	6.62	1.13	24.37	5.98	25.33	4.93	0.62

** $P < .001$

For the experimental teachers, the total attitude scale, as well as the subscales of attitude about one's own confidence to work with the handicapped students and attitude about handicapped students' abilities showed significant gains between pre- and posttests. The subscale on attitude about mainstreaming failed to reach statistical significance. The control teachers, on the other hand, showed no significant gains in any of the attitude scales.

Teachers' tutoring time over a nine week period showed that the control teachers on the average tutored more than the experimental teachers. However, the difference was not significant (see Table 6).

Table 6

Teachers' Tutoring Time by Experimental and Control Groups

	Experimental (n=24)	Control (n=13)	t
Mean	65.79	83.46	1.06
S.D.	40.26	52.27	

It should be noted that the mean tutoring time was aggregated by teacher with no regard to whether the tutoring time was spent with target or regular students.

Student Outcomes

The sample of regular and target students were broken down by group (experimental, control) and by grade level (4th, 5th, and 6th). Descriptive statistics were obtained for each of the subgroups and t-tests for dependent samples were computed within groups and across pre-posttest occasions. Student outcome data include pre-post math achievement and attitude about math. Tutoring time aggregated by target students has not been computed and therefore is not reported here.

Student Math Achievement scores were broken down by grade and status (i.e., regular and target students). A substantial discrepancy was found between the experimental and the control 6th graders in the target group. The pretest group mean for target experimental 6th graders was 17.07, while the corresponding control 6th graders was 12.79 (see Table 7).

Table 7

Student Pre Math Total Achievement Scores
By Group, by Grade, and by Status

	Experimental			Control		
	N	X	S.D.	N	X	S.D.
Regular						
4th	151	16.29	4.58	102	15.42	5.07
5th	141	20.04	5.19	80	21.69	5.05
6th	110	26.99	3.31	74	25.64	3.83
Target						
4th	27	8.37	3.52	29	8.69	3.34
5th	20	10.60	4.12	10	12.80	5.87
6th	15	17.07	5.15	19	12.79	5.79

In short, the pre-test math achievement scores for the subsample of 6th grade control students were substantially below that of the experimental 6th graders. Therefore, the entire subsample of 6th graders was deleted from the analysis. Table 8 displays the math achievement scores and t-test for regular and target 4th and 5th grade students only. Several points are noteworthy. First, 4th and 5th grade students in both experimental and control groups show a pattern of significant gains in the multiplication, division, and fraction subscales. Ceiling effects were reached for these groups on the place value, addition, and subtraction subscales. The pattern of achievement gains for the target students, on the other hand, shows significant gains in the addition, subtraction and multiplication subscales. This pattern exists for the 4th and 5th grade experimental and not for the control students. The experimental target 4th graders clearly outperformed

Table 8

t-Tests of Student Math Achievement Scores
By Group, By Grade, By Status

	REGULAR STUDENTS																	
	EXPERIMENTAL									CONTROL								
	4th (n=151)					5th (n=141)					4th (n=102)					5th (n=80)				
	Pre		Post			Pre		Post			Pre		Post			Pre		Post		
	X̄	S.D.	X̄	S.D.	t	X̄	S.D.	X̄	S.D.	t	X̄	S.D.	X̄	S.D.	t	X̄	S.D.	X̄	S.D.	t
Math Total	16.29	4.58	18.71	5.58	8.35**	20.04	5.19	22.89	5.50	8.04**	15.42	5.07	17.37	5.98	5.81**	21.69	5.05	21.81	6.45	0.18
Place Value	3.60	0.88	3.77	0.67	2.53**	3.76	0.63	3.81	0.59	0.85	3.07	1.32	3.20	1.21	0.97	3.69	0.69	3.38	1.10	2.38
Addition	5.32	0.99	5.36	1.05	0.38	5.47	0.73	5.28	1.14	1.83	5.40	0.84	5.26	1.06	1.57	5.51	0.81	5.10	1.39	2.46
Subtraction	4.15	1.78	4.31	1.74	1.10	4.97	1.43	5.01	1.37	0.39	4.06	1.81	4.01	1.84	0.31	4.96	1.38	4.63	1.67	1.59
Multiplication	1.68	1.29	2.94	1.81	11.55**	3.02	1.83	3.83	1.75	5.31**	1.78	1.69	2.68	1.94	5.78**	3.63	1.70	4.09	1.68	2.37*
Division	1.34	1.41	1.76	2.06	3.23**	2.31	2.01	3.05	2.15	4.11**	1.03	1.47	1.73	2.01	3.79**	3.25	2.04	3.81	2.13	2.31*
Fractions	0.19	0.53	0.62	0.95	5.84**	0.51	0.84	1.87	1.15	13.45**	0.08	0.39	0.51	0.94	5.27**	0.64	0.83	0.84	0.92	2.01*
	TARGET STUDENTS																			
	EXPERIMENTAL									CONTROL								
	4th (n=27)					5th (n=20)					4th (n=29)					5th (n=10)				
	Pre		Post			Pre		Post			Pre		Post			Pre		Post		
	X̄	S.D.	X̄	S.D.	t	X̄	S.D.	X̄	S.D.	t	X̄	S.D.	X̄	S.D.	t	X̄	S.D.	X̄	S.D.	t
Math Total	8.37	3.52	12.07	4.32	5.36**	10.60	4.12	16.15	6.86	4.85**	8.69	3.34	10.14	4.91	2.28*	12.80	5.87	12.50	5.13	0.25
Place Value	2.15	1.56	2.48	1.58	1.51	2.35	1.39	3.00	1.34	1.72	1.72	1.39	2.03	1.57	1.06	2.90	1.60	2.40	1.71	1.25
Addition	3.85	1.73	5.11	1.01	3.38**	4.00	1.41	4.85	1.53	2.13*	4.35	1.40	4.48	1.79	0.44	4.10	0.99	4.70	1.25	1.26
Subtraction	1.70	1.24	3.07	2.02	4.05**	2.10	1.59	3.45	2.19	2.83*	2.24	1.70	2.24	1.96	0.0	2.70	1.83	2.40	1.71	0.63
Multiplication	0.52	0.75	1.00	1.39	2.30*	1.25	1.33	2.25	1.86	2.03*	0.31	0.66	0.97	0.91	3.77**	1.10	1.10	1.90	1.60	2.06
Division	0.15	0.46	0.30	0.78	1.00	0.85	1.27	1.60	1.96	1.80	0.07	0.37	0.31	0.81	1.42	1.80	2.20	1.10	2.03	1.11
Fractions	0.00	0.00	0.11	0.42	——	0.10	0.31	1.00	1.08	3.76*	0.00	0.00	0.10	0.41	——	0.20	0.63	0.00	0.00	——

**p ≤ .01
*p ≤ .05

the control target 4th graders in addition and subtraction. The mean difference for experimental target 4th grade students also appears to be substantially larger than the corresponding mean difference for control students. The target 5th grade experimental students appear to have outperformed their counterparts in almost all math scales, despite the fact that the control 5th graders had a slightly higher pre-test mean.

Data for Attitude Towards Math show an even profile across all groups. Table 9 indicates that none of the within-group comparisons reached statistical significance. The regular students in both experimental and control condition did appear to have better math attitude than the target students in the same grades.

Table 9

t-Tests of Student Math
Attitude Scores by Group, by Grade, by Status

	Experimental					Control				
	Pre		Post		t	Pre		Post		t
	X	S.D.	X	S.D.		X	S.D.	X	S.D.	
Regular										
4th	17.27	7.16	17.33	7.18	0.12	17.23	7.58	16.95	8.17	0.46
5th	16.47	7.92	16.25	7.72	0.42	15.23	7.85	14.21	8.64	1.38
Target										
4th	11.33	7.79	12.59	8.91	0.66	14.04	7.58	14.52	7.61	0.42
5th	11.80	7.19	10.95	7.74	0.55	13.40	8.87	12.30	9.83	0.59

VI. CONCLUSIONS

Several findings from this preliminary analysis of the teacher and student data may be offered. They must be treated as tentative conclusions until more longitudinal data have been collected and analyzed.

The six-week training course produced significant effects on teacher attitudes towards working with mainstreamed handicapped students. Specifically, teachers felt more confident about their own ability to work with these students and about the learning potential of mainstreamed handicapped students. The course did not significantly improve teacher attitudes about mainstreaming as an efficacious model for providing services to handicapped students. In other words, while teachers felt more confident in working with specific mainstreamed students in their own classes, they were reluctant to endorse the mainstreaming practice as neccesarily efficacious for other handicapped students.

With regard to the effects of the course on teacher tutoring skills, the findings suggest that the course is more effective in reducing undesireable tutoring behavior than in improving specific desireable skills. Several hypotheses may be offered to explain this finding. First, the course has only limited effect on improving teacher performance in tutorial situations. Secondly, teacher tutoring skills may be highly resistent to training, particularly when the trainer expects to find short-term effects. The exhibition of improved teacher performance may occur only after an initial "incubation" period in which teachers begin to strengthen and master skills learned during training. Additional post-training data points will provide

some indication of the validity of this hypothesis. Thirdly, it may be inappropriate to expect overall positive changes in all tutoring behaviors. In cases with specific students at specific times, it may be entirely appropriate not to exhibit certain tutoring skills, e.g., asking diagnostic questions when the teacher is aware of the difficulty a student is experiencing. Thus, the exhibition of tutoring skills may be interactive with the nature of the problem the student is experiencing and the specific intent for the tutoring session.

Student data showed that experimental target students did make significant gains in math achievement and that these gains were made primarily in addition, subtraction, and multiplication areas. Considering that the regular students had advanced to division and fractions, the findings suggest that teachers may have attempted to accommodate individual differences presented by the inclusion of mainstreamed handicapped students. This and other mediating variables may have had substantial direct impact on student achievement gains. We hope to uncover some of these variables, e.g., tutored time aggregated by student, with additional analyses of the data.

Student attitudes about math appear to be highly stable, at least over the three months time interval between tests. No significant gains or reduction in math attitude are evident for any of the groups of regular and target students.

Tutoring time aggregated by teacher showed no significant difference between experimental and control teachers. Further analysis will aggregate tutoring time by student and relate it to student math achievement.

To reiterate, the conclusions above are only tentative, subject to the collection and analysis of more longitudinal data. Findings on the full impact of the training course on teachers and students will be made available in the near future.

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